WFL Contractor Quality Control and Quality Assurance Plans and Systems

These guidelines are intended to assist WFL Contractors in the preparation of acceptable Contractor Quality Control and Quality Assurance Plans (CQCQAP). They are based on the requirements contained in the Special Contract Requirements, Section 153 of the Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects (FP). These guidelines are not contractual requirements, and do not supplement or supersede any contractual requirements.

Introduction

A contractor quality control and quality assurance plan (CQCQAP) is the documentation of the contractor's process for delivering the level of construction quality required by the contract. This document is intended to provide guidance to contractors, subcontractors and suppliers as to what is expected from CQCQAPs.

The CQCQAP is the framework of the contractor's process for delivering quality construction. The plans and specifications define the expected results or outcome. The CQCQAP outlines how those results will be achieved. While it is not possible to determine from the CQCQAP whether the level of construction quality will be acceptable, it is possible to verify that the contractor, as an organization, has addressed the basic elements of its quality process. These guidelines address, not only what should be in the CQQACP in order for it to be acceptable to the Government, but also what elements the Government's QA process needs to have in order to assure quality without usurping the contractor's responsibilities.

The **standard industry definitions** are as follows:

Quality Control: The sum total of activities performed by the seller (producer, manufacturer, and/or contractor) to make sure that a product meets contract specification requirements.

Quality Assurance: All those planned and systematic actions necessary to provide confidence that a product or service will satisfy given requirements for quality.

What does this mean to you and me? Quality Control is doing the work in an acceptable manner. Quality Assurance is making sure the work gets done in an acceptable manner.

How do you explain it?

The contractor is responsible for doing work that meets the contract requirements. **Quality Control** is the things the contractor does to make sure the work meets the contract before and during and after construction. It is testing materials, it is checking the grade of a culvert prior to backfilling, it is making sure the lifts are the right thickness, it is making sure the wall is at the right grade, it is making sure the bolts are tightened properly on the guardrail, it is making sure the subgrade is finished to tolerances.

Quality Assurance is a check of the quality control – is the quality control process working so that the final product meets the contract requirements? It is the spot check of the slope stake notes, it is the checking of the work of a subcontractor such as reinforcement steel spacing, it is the check of the grade of a culvert, it is the check of the excavation and/or embankment slope. It is the verification of previous the quality control activities. It assures that the work will result in the quality product you are looking for. The contractor is being asked to double check his work – to make sure his quality control is working.

FAR Requirements

FAR Clause 52.246-12 Inspection of Construction is the foundation for all contract requirements dealing with quality control and quality assurance. In summary the clause:

- Requires the contractor to maintain an adequate inspection system and perform inspections that will ensure contract compliance.

- Requires the contractor to maintain inspection records and make them available to the Government.

- Allows [but does not require or obligate] the Government to do its own tests and inspections and requires the contractor to assist.

- Says that Government tests and inspections are for its benefit and do not take the place of the contractor's quality control obligations.

- Says that anytime the contractor tells the Government that work is ready for inspection and it is not [i.e. it is in noncompliance], the Government may charge the contractor for the costs of its inspections and tests.

- Says that the contractor is obligated to comply with the contract whether or not a Government inspector is present.

- Says that the Government may order previously completed work torn apart for inspection, and that if it is noncompliance, the Contractor will pay for the inspection and the correction of the work. If it is in compliance the Government will pay for the inspection and disruption to the work.

Organizational Structure – Subsection 153.03

One of the first issues a contractor, or any organization must face when designing its QCQA procedures, is how these systems will relate to, and impact its organizational structure.

Separate Quality Staff – Inspection and testing are very specialized functions. A contractor may elect to hire a separate staff or subcontractor to perform testing and inspection and to generate the documentation required by the FAR Clause and the contract. If a contractor has a separate quality staff, it is important to define the relationship between those personnel and the production organization. What will be the disposition of failing tests/inspections? Who will have authority to order production ceased? Under what circumstances? What will be the conditions of restarting production?

Combined Staff - Quality management experts generally discourage separating quality control and assurance personnel from production personnel. It pits one part of the organization against another. This built in adversity is seen as both inefficient and requiring additional staff. Ideally quality control should be achieved by developing an organizational culture, which encourages quality - a culture that is embraced by everyone in the organization.

However the makeup of the structure, a Quality Manager must be assigned and be available during all phases of the work. This person will manage the contractor’s quality control and quality assurance activities. For most projects the Superintendent, project manager or foreman cannot be designated as quality manager. The contractors quality systems must be a priority and cannot take a back seat to other primary functions.

Quality Control and Quality Assurance Systems- Subsection 153.04, 153.05

Testing and inspection provides a reflection of quality and the process. But only changes to the process can improve quality. Extensive inspection needed to identify defects so that they can be corrected is an indication of a poor process. Ideally frequencies of QC and QA inspections are dependent on characteristics of the overall process. In a transition environment however, when not used to performing formal QC and QA systems, it may be necessary to increase inspections to minimize the risk of serious deficiencies undetected until late in the process.

It is easy to become preoccupied with testing when describing a QCQA plan. Testing is easily defined and leaves a clear documentation trail. But the non-materials based testing and inspection, for example the inspection of a culvert staking survey and location of structures, and the organizational resources that actually will control the quality of the construction are by far, the most important part of the plan, even though describing these resources and procedures [the process] in writing is often difficult.

For materials the contract may contain a listing of mandatory contractor testing including sampling points, frequencies and time limits for delivering results. This testing is intended primarily for the agency's use in documentation and accepting the work. Some contracts require additional testing identified as *production* testing which is intended to provide real time information during the construction and manufacture of materials to allow the contractor to adjust or control the process and ensure that testing at the end of the process will indicate compliance. Whether or not the contract specifies production testing, it is up to the contractor to address whether or not it is needed in the Contractors QCQA. Frequencies of, inspection points and time limits of non-materials based items of work are not normally provided in the contract. This is where the contractor must thoroughly analyze under each definable feature of work what inspections or tests will be performed.

Charts are a simple method in which to describe the QC system for each definable feature of work. In them, persons responsible, testing or inspection activity and frequencies can easily be shown.

Most organizations have intuitive QCQA processes, which have evolved over time to reflect the requirements of company management. For example, most companies have their own way of monitoring production, quality and deficiencies. Describing and documenting these processes formally within a QCQA framework in writing is often difficult. There is almost no physical limit to the length and detail included in this section. Every requirement, every sentence in the contract could precipitate a paragraph or more of detailed process control procedures to describe how that requirement will be fulfilled. From a practical point though, this is excessive. For most typical FLH construction projects the narrative and charts covering quality control and quality assurance system procedures should adequately address the details in one to three pages for each definable feature of work (see below). This does not include, certifications, personnel résumés and other attachments. The fact that many of the detailed requirements of the contract are not specifically addressed in the CQCQAP does not mean they can be ignored. The contract requirements themselves are the foundation for the outcomes expected from the CQCQAP.

For QC systems describe in narrative and chart form QC personnel, what inspections, tests and activities will be performed for each definable feature of work as the work progresses. Describe inspections, testing or other activities that will be used to monitor quality while the work is in progress.

For QA systems develop narrative that describes QA personnel, what inspections, tests, plans and activities such as materials certification verification, site preparation, staking adequacy, methods of

construction adequacy, environmental restriction considerations, and training or instructions provided. Describe what steps will be taken when deficiencies are noted during QA review, inspections or testing. QA should describe what will be performed to verify that work is prepared, started and completed in accordance with the contract, and further provide a process to verify that the QC system is functioning.

Categories and Definable Features of Work – Subsection 153.04(b)

To be assist in reviewing project work and developing QCQA plans a typical contract may be divided into multiple categories depending on the nature of the work and the organizations performing the work. For example stakeout, clearing, excavation and embankment might be grouped together as a single category of **Grading**.

Sometimes how categories are defined is influenced by which subcontractors or crews do the work, since each may have its own organizational relationships. It should be left up to the contractor to group items of work in logical categories to facilitate the development of the CQCP. Other typical categories are as follows.

Pavement Structure

Grading

Safety Appurtenances

Seeding and Landscaping

Temporary Traffic Control

Bridge

Definable features of work are sub items within the categories of work, of which specific QCQA activities are outlined in the QCQA Plan. For example definable features of work under "Bridge" would be survey, structural excavation, forming, reinforcing steel, concrete placement and curing. This is where the details of the QCQA process are described for the individual features of work. The **who, what, when, where and how** (see below) need to be adequately described for the separable work items

Preliminary, Startup, Production and Completion Phases

To further understand QCQA the terms preliminary, startup, production and completion phases are terms that are used to help define and grasp the quality control and quality assurance process. The contractor's system does not have to be modeled under this framework but the concept of separating the distinct phases of work may help in defining and developing a process.

The preliminary phase is critical. During the preliminary phase the contractor verifies that everything is in place to begin the work. It is where the contractor has developed a plan to attack the work and knows exactly how the work will be performed barring any glitches. The preliminary phase includes evaluation of equipment, materials and other resources prior to commencing the work. For example, the review and approval of materials certifications. It also includes crew training of contract requirements or other special circumstances. Training does not always mean formal classroom training. The preliminary phase also includes verifying that preliminary work such as staking and clearing for instance, have been completed in accordance with the contract and have been previously evaluated under their own requirements of the QCQA plan.

Startup includes the additional management, training and inspection resources usually needed when a new operation is started. Usually minor changes are made to processes once work is underway.

Production addresses the routine QC and QA resources necessary after the process is established and production is ongoing. Describing what is needed to maintain an adequate quality level during production**.**

The completion phase is a description of the activities that will take place to verify that the final product meets the requirements of the contract. What testing or inspections will be recorded to document contract compliance? What arrangements have been made for Government QA inspection? What pay note or measurement documentation will be provided?

The Who, What, Where, When and How.

For each definable feature of work, the QCQA plan should answer these questions whether it is framed in the context of the phases described above or with any other developed process.

Who will be responsible for QCQA throughout the operation? A Quality Control Technician may be assigned responsibility for testing and documentation and perhaps even training and monitoring of startup. As the operation moves toward production and closeout however, other QCQA personnel may be assigned increasing responsibility.

What will be done to ensure contract compliance? What work, what stage and at what frequency will work be inspected and tested? What will be inspected, Grade? Alignment? Spacing of reinforcing steel? Construction survey staking? Aggregate gradations? What authority will the person have over operations? What portion of the time during the work will the identified person actually be present to perform QC or QA responsibilities? Testers and inspectors cannot control quality if their responsibilities are limited to testing, measuring and documentation. "What" should address not only personnel and activities, but materials and equipment used in the construction. These items often have stated or implied contract requirements, and the QCQA system must verify that those requirements are met. What documentation will be provided to record inspection and results of inspections?

Where will these activities be performed? Will optional production testing and inspections be performed? Will manufactured materials be inspected at the plant, at the contractor's facility or at the site of work? Will the equipment be inspected at the yard, or will inspections be performed at the site?

When will these activities be performed? How many inspections or tests will be performed at what frequency? The earlier QCQA activities are performed, the more latitude the contractor has in dealing with problems. However, when activities are performed too early there is a risk of unforeseen changes or glitches prior to actual construction. When will test results and inspection narrative be available? This is a key component of the QCQA plan, which determines largely how responsive it can be to deficiencies.

How will inspections be performed? Will standard checklists be developed from the specifications? Have arrangements been made with subcontractors or others to provide access to the work? What equipment will be needed to perform the inspections or tests? What documentation will be produced as a result of the inspections or tests? The more generalized and vague the inspection procedures are, the more likely they will not be consistently effective.

The CQCP should minimize any parroting or paraphrasing of requirements in the contract, and should avoid simply promising to comply with the contract. These kinds of statements and assurances are of essentially no added value. The CQCQA plan must go beyond boilerplate descriptions and address the contractor's QCQA organization and process for consistently delivering the level of quality that the contract requires.

Subcontractors

When subcontractors and suppliers [other than suppliers of commercial items] provide part of the work, then the QCQAP needs to be clear whether their QC responsibilities will be independent, or a part of the prime contractor's responsibilities. Remember the Primes' quality manager is in overall control of the project QCQA. If they are independent, then the subcontractors or suppliers QCQAP must be developed and submitted for approval, through the prime. Otherwise, the prime must address how it will monitor and verify subcontractor quality as a part of its plan. In either case the prime is contractually responsible for all the work.

Manufactured Materials

An important part of the CQQAP is the process for verifying that manufactured materials comply with the requirements of the contract.

Commercial Items - These are materials manufactured and sold to the general public, as opposed to materials made to the unique specifications of the agency. For most commercial items, the contractor's responsibilities are limited to verification that the materials are as required or permitted in the contract, and that the delivered materials are in fact those approved materials. Some materials which are arguably commercial are considered of critical importance, and have specific QCQA requirements in the contract.

Non-commercial Items - These are materials manufactured offsite, but specifically to agency specifications for this project. QCQA plan coverage for non-commercial items should be a separate document from the manufacturer, or the manufacture of those items should be included in the QCQA plan of the contractor or a subcontractor. Like critical commercial items, critical non-commercial items may have specific QCQA requirements in the contract.

Records and Documentation. Subsection 153.07

While good documentation is often a reflection of good quality control, documentation is not the same thing as quality control. Adequate documentation is necessary to concisely document the process and results of the contractors QCQA system. Minimum documentation is outlined in the Special Contract Requirements. These include charts or tables of definable features of work describing QC and QA activities, the daily quality control and assurance report where all QCQA activities are documented, Form 470 the notification of completion of work that is used to notify the Government that certain work is completed and is ready for Government QA and pay item measurement notes all make up records and documentation.

Partial Plans – Subsection 153.02

It is possible, and very likely that subcontractors, suppliers and overall responsibilities for some latter phases of the construction, will have not been arranged at the time the prime is ready to begin on the initial phases. It is permissible for the contractor to submit, and the agency to accept a partial plan. In many cases, a contractor may not be able to develop a thorough and concise QCQA plan for many of the definable features of work by the notice to proceed date. The contractor may not have developed an internal plan on the methods, materials and approach or crews that will be used in the performance of the work. A good QCQA plan cannot be developed until the contractor has decided how they intend to complete the work. A QCQA plan that is submitted very early on, and that is full of generalities can be more harmful than beneficial. A QCQA plan without details and specifics that addresses the requirements of the contract will not be acceptable.